Collaborative Conservation
A presentation to the Groton Conservation Forum
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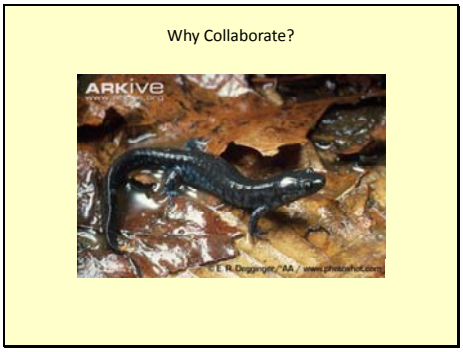
First, I am honored to be speaking to this group of people so committed to the protection not only of Groton's natural resources, but indeed to the conservation of regional and global diversity. As a high school teacher I am particularly happy to be speaking to a group of people who have actually chosen to listen to what I have to say, but nonetheless I will keep my remarks brief and recognize that many in the audience have more expertise in many of these subjects than I. I hope that you will all feel free to interrupt, argue, challenge or question my ideas. And, I do want to emphasize that these are my ideas and I am not speaking as a representative of either the Groton Conservation Trust or the Groton School.

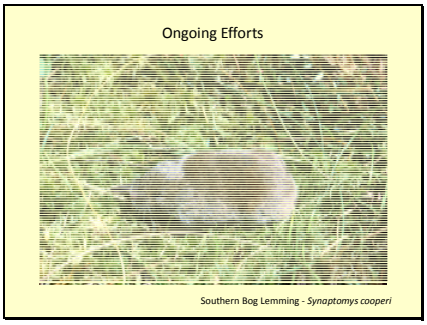
Why start with the water shrew? This is a lesser known but particularly cool member of the community of listed species which find a home in Groton. It is also a species about which we know very little in general, and effectively nothing about those who live in Groton. We probably have the eastern most population of the species in the Commonwealth and thus it is likely that this animal is particularly susceptible to climate change, but how can we protect a species in the face of almost no information about its distribution and habitat needs?

Please note that I am not going to answer this question, but to me this underscores the challenges that we face and the critical importance of working together to maximize our chances of success.



Here in Groton we have a truly remarkable concurrence of circumstances. We live in a region that has an inherently high level of biodiversity given the conditions with which we are all familiar: the spatial juxtaposition of different habitat resources located at the conjunction of multiple ecoregions. Beyond this, historically we have not only protected a significant area of open space but managed to protect many of the most important bits. And finally the last four decades have brought us a dedicated group of competent and informed people who have been strategic and effective in their conservation efforts.

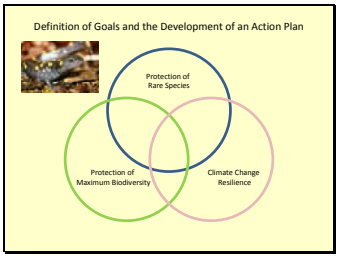
We live in an area where blue-spotted salamanders and Blanding's turtles thrive and in some cases there are hints of population increases. We currently have the good fortune and responsibility to steward a remarkable place in the world. Given this success, why don't we keep moving forward as we have and trust that our efforts will continue to yield the same positive results that we have seen in the past?



In the almost thirty years that I have lived in Groton I have seen effective land protection strategies implemented, critical lands acquired for protection, and a commitment to identify those parcels that are most important for protection in a manner that has the potential to allow us to work quickly and nimbly when opportunities arise. Turtle crossing signs have bloomed along our roadsides and stewards do remarkable work managing the lands that have been set

aside. Our town government is supportive of these efforts and bolster the work of the conservation community.

So what do we need to do now as a larger group?



The answer is disappointingly obvious: we do not have enough land or enough resources to protect all species which live in Groton for all time, necessitating decisions about the goals of any program any group undertakes. While I do not suggest that the three goals shown above are the only ones to strive for, most would argue that they represent the general approach taken by conservation biologists. We can focus our efforts on the protection of rare and vulnerable species, on the preservation of the maximum number of species or on the creation of ecosystems which are likely to be the most resilient to climate change.

As my poorly constructed Venn diagram suggests, there is considerable overlap in the actions needed to achieve these three goals. For all of these we need to minimize both chemical and biological pollution, minimize disturbance and perhaps increase connectivity among parcels, although things quickly get more complicated in this case. And yet, most actions that we take will be more supportive of one goal than another. And yet, in other ways, programs to protect a given species or population may reduce the overall biodiversity in a system. Managing for climate change resilience might call for protecting the common at the expense of the rare.

The spotted salamander pictured above is classified by the International Union for the Conservation of Nature as a species of least concern and is not classified by the US or Massachusetts governments as being at risk. I suspect that if all of these agencies had been around in 1900 they would have said the same thing about the passenger pigeon, a species that would be extinct within two decades. And yet, this is an example of a species that is likely to be tremendously affected by climate change and habitat fragmentation. To me the threat to biodiversity that so many species face today is vastly more severe than that faced by these doomed birds at the turn of that century.

Will the changes in precipitation and temperature that we are already seeing leave these common species vulnerable to local extinction in our life times? Many would suggest that this is

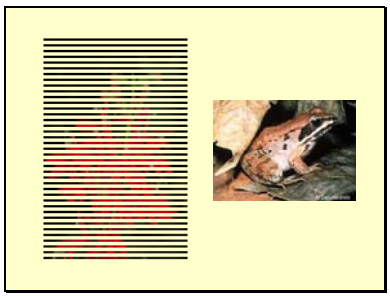
the case and scientists are scrambling to gather the data that we need to be able to answer these questions.

I believe that this should be one of the first discussions that we have as a group. We can try to do all three and different organizations can adopt different strategies, but it would certainly be helpful for all of us to know what we are each doing. The actions of any one group will have profound impacts on the effectiveness of those of others.

However, despite these questions there are some things that form the basis for future actions.

Large populations are good. This is perhaps the most self-evident statement of the evening, but this leads to some critical questions. Large populations are important because they reduce the probability of what are called stochastic extinctions: a few generations with too few females or a tornado that happens to touch down in exactly the wrong spot.

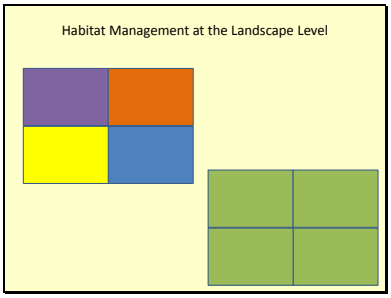
Perhaps more importantly is the importance of maintaining a large population size to preserve genetic diversity. Small populations lose genetic material because some individuals do not breed. If one of these unfortunate individuals is carrying the gene that confers resistance to the next disease to appear, or that allows an individual to better respond to the more severe August droughts, the entire population is at risk.



Our ecosystems are being disrupted in profound ways and the populations that will survive must be able to adapt. We must save enough flowers so that some that open earlier or later and will interact with pollinators emerging at new times as patterns of day length and temperature change abruptly. In a fantastically complex system, plants and insects have coevolved so that the animals have food throughout the year and the plants have access to insects that will carry their pollen to another individual of the same species. Climate change will likely disrupt these cycles, creating instability in a finely tuned system that threatens so many populations.

Vernal pool breeders who metamorphose fastest will keep populations alive as their breeding pools dry ever earlier in the season. And while there offspring will be smaller and therefore historically less fit, they may hold the key to survival of the population.

But this leads to one of our first critical questions that each group needs to answer immediately. How do we manage the lands that we have?



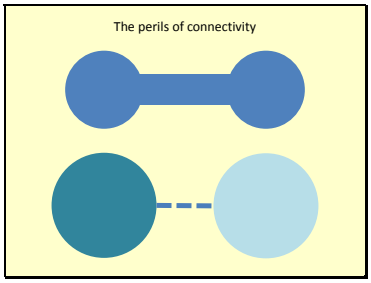
The time when an open space could be set aside and left alone is behind us if we want to protect regional biodiversity. All of us in the room are aware of this: we mow fields to preserve early successional communities, remove invasive plant species when we have time, put up nest boxes and carefully consider the types of recreation most suitable for a parcel. We discuss hunting and the location of trails and we work to achieve a balance between the demands humans place on the lands with those needed by the plant and animal life that shares the space with us.

But we know that we now need to go further. We need to consider what types of plant communities are needed to achieve our goals and how to manage our lands to create these. Historically we have looked at the mosaic of habitat types as being the ideal solution to the preservation of as many species as possible, but current science tells us clearly that small habitat fragments may in fact reduce diversity when compared to the benefits of a single large parcel. The perceived diversity at the edge between two habitats is now understood in fact to reduce the diversity of an area as those species that depend on the core undisturbed areas disappear. Again, we must decide what we want to protect and then act to achieve this. A large homogenous parcel will maximize population size and create a more climate resilient preserve than one made up of small patches of different habitats. But unless all of the habitat types are protected we will lose species.

In order to protect Bobolinks we need a large area of grassland managed to allow for the fledging of the species. Many of our organizations own smaller parcels of managed grasslands; does it make sense to continue in this way, or should the best existing grasslands be enlarged to fully protect this species, recognizing that other species will suffer from this practice on any given parcel?

The Massachusetts Natural Heritage Program has indicated concerns about declines in population of the leopard frog in Massachusetts attributable to habitat loss, degradation and fragmentation. The protection of this species will require the identification of suitable habitats to protect this species on a town-wide level and then determining who will maintain the open spaces adjacent to suitable wetland breeding sites that are disappearing so quickly as invasive shrubs take over these critical areas.

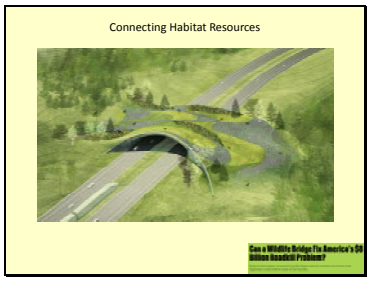
If individual groups work to maximize habitat diversity on their own small parcels we may actually be creating a situation where many small populations are unable to adapt to a changing environment



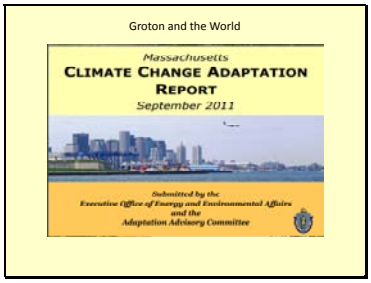
Connecting parcels is good – animals can disperse from one area to another, replacing dwindling populations and providing necessary injections of new genetic material among the groups.

However, these corridors work equally well for pathogens, causing some concern as exotic fungi, bacteria and viruses flood into our country. Connectivity can make up for the problem of small populations facing stochastic extinction, but this comes at a cost. More isolated populations evolve to maximize their fitness in slightly different environments, helping to preserve the genetic diversity in a species on a larger scale. If we can create habitats that support large viable populations, the need for connectivity is reduced and we can gain some of the advantages that come with more isolated populations.

However, there are important exceptions to this.



Places where animals cross roads not to disperse to new habitat are critical to the survival of many of our species. Turtles follow extended migratory loops for feeding and breeding and amphibian losses during the peak days of migration are almost certainly not sustainable. Collectively we need to identify the sites where bridges and tunnels are critical to a population's persistence and someone needs to take on the significant task of financing and permitting these activities.



As I constantly tell my students, we are in the midst of a massive experiment, and we will understand the effects of climate change on biodiversity in a century or so.

It is clear that for most species that climate will change at a rate that would require adaptation at a rate that has not been seen for about 65 million years. While preserving large populations in slightly different environments maximizes the possibility of this occurring, it is almost certain that the survival of many species will depend on their ability to move with the climate and hope that the conditions in their new habitats will allow for survival. The largest areas of open space are going to provide the stepping stones needed for plants and animals to move. As plant seeds lead the move north we have to have ecosystems ready to accept them and the animals that will follow.

Managing our lands for this requires the creation of large habitat parcels that contain the subtle differences in factors that will increase the probability of a species finding the conditions that allows it to survive.

Conclusions